

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re PATENT APPLICATION of

Jaishankar Moothedath Menon	Art Unit:	2189
Serial No: 10/716,136	Examiner:	R.G. Bragdon
Filed: November 18, 2003	Confirmation No.:	7019
For: METHOD OF PROTECTING DATA ON A DISK DRIVE FROM UNCORRECTABLE MEDIA ERRORS	Attorney Ref.:	ARC920030069US1

**APPEAL BRIEF**

**MAIL STOP APPEAL BRIEF - PATENTS**

Commissioner For Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sirs:

This Appeal Brief is submitted in connection with the Notice of Appeal submitted December 3, 2008, the final Office Action dated September 3, 2008, the Amendment In Response To Final Rejection submitted December 3, 2008, the Advisory Action dated October 31, 2008, the Notice of Non-Compliant Amendment dated December 17, 2008, and the Supplemental Amendment In Response To Final Rejection submitted January 1, 2009, in the above-captioned patent application.

**REAL PARTY IN INTEREST**

The real party in interest is International Business Machines Corporation.

## **RELATED APPEALS AND INTERFERENCES**

There are no appeals or interferences that are related to the present appeal.

## **STATUS OF CLAIMS**

Claim 1-14 are pending and stand finally rejected in the above-captioned patent application. Claim 15 has been canceled. Claims 16-43 have been withdrawn from consideration.

Claims 1-14 are the subject of this appeal.

## **STATUS OF AMENDMENTS**

All amendments made to the claims have been entered. There are no amendments of the claims that have not been entered.

## **SUMMARY OF CLAIMED SUBJECT MATTER**

There is one (1) independent claim that is the subject of this appeal, independent claim 1. In the following paragraph, the references to the subject matter of independent claim 1 refer to locations in the originally filed patent application and the originally filed figures.

Independent claim 1 is directed to a method for protecting data stored in a RAID-configured storage system from uncorrectable media errors. (See paragraph [12], lines 1-2, and paragraph [18], lines 1-3.) The RAID-configured storage system has a plurality of storage units. (See paragraph [12], lines 3-4, and paragraph [26], lines 1-6.) The method comprises associating  $n$  data information disk sectors with  $c$  redundancy information disk sectors. (See paragraph [12], lines 4-5, paragraph [20], lines 1-2, and Figure 3) The  $c$  redundancy information disk sectors are based on the  $n$  data information disk sectors. (See paragraph [12], lines 5-6.) The variables  $n$  and  $c$  are integer value numbers greater than zero. The  $n$  data information disk sectors with  $c$  redundancy information disk sectors are written on the same storage unit. (See paragraph [12], lines 6-8, and paragraph [20], lines 3-4.)

## **GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

Claim 1 stands finally rejected under 35 U.S.C. § 103(a) as unpatentable over Servi et al. (Servi), U.S. Patent Application Publication No. 2004/0107400 A1.

Claims 3, 8, 9, 13 and 14 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Servi in view of Kaneda et al. (Kaneda), U.S. Patent No. 5,958,067.

Claims 2, 4-7 and 10-12 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Servi in view of Hetzler et al. (Hetzler), U.S. Patent Application Publication No. 2005/0015700 A1.

## **ARGUMENT**

### **I. The Rejection Based On Servi**

Applicants respectfully traverse the rejection of claim 1 based on Servi. Applicants respectfully submit that the subject matter according to claim 1 is patentable over Servi because Servi does not disclose or suggest the subject matter of claim 1. Further, Applicants respectfully submit that the Examiner's proffered line of reasoning for modifying Servi to provide the subject matter of claim 1 is not convincing because the Examiner's proffered modification of Servi improperly changes the principle of operation of Servi, and the Examiner ignores the disclosure of Servi.

#### **A. Servi Does Not Disclose Or Suggest The Subject Matter Of Claim 1**

1. The Examiner asserts that Servi "teaches ... associating n data information sectors (Fig. 11, D 1-10; paragraph 44) with c redundancy information sectors (Fig. 1, P 1-6; paragraphs 45, 46), the c redundancy information sectors being based on the n data information sectors, and n and c being integer value numbers greater than zero ... ." (See final Office Action dated September 3, 2008, page 3, lines 22-25.) The Examiner also indicates that Figure 1 of Servi shows an integer number of Servi data points D1-D10 and an integer number of Servi parity points P1-P6.

2. Applicants respectfully submit that the Examiner's assertion that the Servi data points D correspond to the claimed data information sectors and that the Servi parity points P correspond to the claimed redundancy information sectors appears to have merit – until the Servi disclosure is examined a little closer.

3. Applicants respectfully submit that Servi relates to a technique for protecting data that uses points in a bipartite graph that have been selected to have a degree distribution that has been found to be particularly advantageous. (See Servi, paragraph [0038].) According to Servi, the parity points are selected to have a degree distribution with very few (and preferably no) low degree parity points. (See Servi, paragraphs [0038]-[0040], and [0066].) Servi discloses that for a parity set of a given size, it has been appreciated that better performance can be achieved by allocating parity points to have a relatively higher degree. (See Servi, paragraph [0066].)

4. Servi discloses one embodiment that “enables a user to specify the number of bits in the data set, as well as the maximum number of parity bits that the user is willing to support.” (See Servi, paragraph [0073], underlining added.) In particular, Servi discloses that Tables 5-8 may be used as a guide for selecting appropriate values. (See Servi, paragraph [0077].) Tables 5-8 of Servi show that to achieve a relatively small expected percentage loss of data bits, parity points having a relatively high degree should be used. For example, in Table 5, for a 1 % expected loss for a data set of 5040 bits, the parity degree of the parity bits should range from 160 to 200. According to Servi, the number of parity bits for a 1 % expected loss in data is 130 bits. For an expected 10 % loss of 5040 data bits, the parity degree of the parity bits should be range from 18 to 25 bits. The number of parity bits for an expected 10 % lost of data bits is 860. Tables 6-8 show similar information.

5. Applicants respectfully submit that to consider the relevance of the Servi technique to the claimed subject matter, imagine ten (10) data information disk sectors in which each data information disk sector size is 512 bits for a total of 5120 bits. Note that the number of total bits – 5120 – is an integer. If, by way of example, the Servi exemplary case in Table 5 of 5040 bits is scaled to correspond to the ten data information disk sectors of 5120 bits (i.e., using

a scale factor of approximately 1.01590), none of the number of Servi parity bits for the exemplary percentage losses (i.e., 1 %, 10 %, 20 %, 50%, and 75 % losses) scale to be an integer value.

6. Plainly, Servi is not relevant to the subject matter of claim 1, and the Examiner's assertion is without merit that the Servi data points D correspond to the claimed data information disk sectors and that the Servi parity points P correspond to the claimed redundancy information disk sectors. That is, a Servi data point D does not correspond to a claimed data information disk sector, and a Servi parity point P does not correspond to a claimed redundancy information disk sector.

7. Moreover, it is respectfully noted that in the stated rejection the Examiner has not taken the initiative to use any of the disclosed Servi techniques (i.e., Tables 1 and/or 4 and Tables 5-8) for generating parity bits based on a specified number of data bits such that c redundancy information disk sectors are generated based on n data information disk sectors, and such that n and c are integer value numbers greater than zero.

8. It should be noted that Applicants have respectfully invited the Examiner (and the Examiner is still invited) to prove how any of the techniques disclosed by Servi can be used to generate parity bits for a selected number of data bits that yields c redundancy information disk sectors that are based on n data information disk sectors such that n and c are integer value numbers greater than zero. Even though Servi discloses one embodiment that "enables a user to specify the number of bits in the data set, as well as the maximum number of parity bits that the user is willing to support" (see Servi, paragraph [0073], underlining added), the Examiner has not responded to Applicants' invitation. Consequently, Applicants consider the Examiner's lack of response to be a tacit admission by the Examiner that the Examiner cannot prove that any of the techniques disclosed by Servi to generate parity bits for a selected number of data bits that yields c redundancy information disk sectors that are based on n data information disk sectors such that n and c are integer value numbers greater than zero.

9. Applicants respectfully submit that even if paragraph [0052] of Servi, which has been cited by the Examiner, is considered, the Servi disclosure relating to how the

data set and the parity set may be stored on the storage medium does not cure the fact that none of the embodiments of Servi disclose or suggest a method comprising associating  $n$  data information disk sectors with  $c$  redundancy information disk sectors, such that the  $c$  redundancy information disk sectors are based on the  $n$  data information disk sectors, and such that  $n$  and  $c$  are integer value numbers greater than zero.

10. Thus, Servi does not disclose or suggest a method comprising associating  $n$  data information disk sectors with  $c$  redundancy information disk sectors, such that the  $c$  redundancy information disk sectors are based on the  $n$  data information disk sectors, and such that  $n$  and  $c$  are integer value numbers greater than zero.

#### **B. The Examiner's Proffered Line Of Reasoning For Modifying Servi**

1. At page 4, lines 4-9, of the final Office Action dated September 3, 2008, the Examiner states that "Servi did not explicitly mention that the sectors should be 'disk sectors' (i.e., RAID parity sectors)," the Examiner then concludes that

"it would have been obvious to one having ordinary skill in the art at the time the invention was made to keep the parity data or [sic] Servi in dedicated disk sectors (as opposed to 'tracks' or 'clusters' or 'blocks') since (1) sectors were a well recognized disk partition size at the time of the invention (sectors are basically small sections of tracks) and (2) the Servi system utilized disks."

2. Regarding this conclusion, Applicants respectfully submit that: "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). (See, also, MPEP §§ 706.02(j) and 2144.)

3. In the present instance, the Examiner has not stated that Servi expressly or impliedly suggests the claimed subject matter.

4. Consequently, in order to support the present rejection, the Examiner's line of reasoning must be convincing as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

**C. The Examiner Improperly Changes The Principle Of Operation of Servi**

1. Applicants respectfully submit that in order to modify Servi to become the subject matter of claim 1, the principle of operation of Servi must be improperly changed.

2. To address Applicants' arguments on this issue, the Examiner uses a syllogism in which the major premise is "as presently written, the claims 'storage unit' may include in its scope the entire RAID array." (See final Office Action dated September 3, 2008, page 8, lines 21-22.) As a minor premise, the Examiner asserts that "c=1," and as a conclusion, the Examiner states that "any RAID system that has any parity in it whatsoever would teach claim 1 is entirely correct." (See final Office Action dated September 3, 2008, page 8, lines 23-24, underlining added.)

3. Regarding the Examiner's major premise, Applicants respectfully submit that the major premise is without basis because the Examiner's assertion relating to the interpretation of the claimed "storage unit" is contrary to the "Broadest Reasonable Interpretation" standard set forth in MPEP § 2111.<sup>1</sup>

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<sup>1</sup> The Examiner asserts at page 6, lines 1-2, of the final Office Action dated September 3, 2008, that "[s]ince applicant has not placed any limitation on what constitutes a 'storage unit' in the claims, this feature must be given its broadest possible limitation ... ." [Underlining added.] Backtracking for a moment, Applicants respectfully note that at page 10, lines 6-8, of the non-final Office Action dated January 10, 2008, and at page 8, lines 15-17, of the final Office Action dated September 3, 2008, the Examiner states that "the claims must be given their broadest reasonable interpretation". [Underlining added.] While replacement of the words "reasonable interpretation" with the words "possible limitation" has the apparent effect of morphing the Examiner's position into a winning argument, such an expansion is plainly contrary MPEP § 2111, which states:

"The Patent and Trademark Office ("PTO") determines the scope of claims in patent applications not solely on the basis of the claim language, but upon giving claims their broadest reasonable construction 'in light of the specification as it would be interpreted by one of ordinary skill in the art.'" *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364[, 70 USPQ2d 1827] (Fed. Cir. 2004).

4. In particular, Applicants respectfully submit that in light of the specification, one of ordinary skill in the art would NOT interpret the claimed “storage unit” in a manner that would “include in its scope the entire RAID array.”

5. Applicants respectfully submit that, instead, one of ordinary skill in the art would interpret the claimed “storage unit” to comprise a Hard Disk Drive (HDD), a Random Access Memory (RAM) storage device (both volatile and non-volatile), an optical storage device and/or a tape storage device. (See paragraph [26], lines 1-4, and claims 10-12 of the originally filed patent application.)

6. Moreover, Applicants respectfully submit additional reasons that one of ordinary skill in the art would interpret the claimed “RAID-configured storage system” to comprise a plurality of the claimed “storage units” includes that:

(a) claim 1, lines 2-3, sets forth such a concept;

(b) the specification describes an exemplary array 200 formed from six storage units, such as Hard Disk Drives (HDDs), arranged in a RAID 6 configuration (see paragraph [19], lines 1-2, and Figure 2 of the originally filed patent application);

(c) the information contained in the “Drives/array” line in Table 2 of the originally filed patent application; and

(d) the subject matter of claims 2-6 and 10-12.

7. Additionally, the Examiner’s stated interpretation of the scope of the claimed “storage unit” throughout the final Office Action dated September 3, 2008, is inconsistent with other statements made by the Examiner, and does not make sense when considered in light of the specification and claims “as presently written.”

8. In particular, on one hand, the Examiner takes the position that Servi discloses “a RAID-configured storage system having a plurality of storage units.” (See final Office Action dated September 3, 2008, page 3, lines 19-21.) On the other hand, the Examiner then asserts that the “broadest possible limitation” [underlining added] of the claimed “storage unit” morphs the scope of the claimed “storage unit” into the entire RAID array (see final Office



Action dated September 3, 2008, page 8, lines 21-22), thereby completely ignoring the Examiner's own words regarding claim 1 "as presently written."

9. Applicants respectfully submit that contrary to the Examiner's stated inconsistent interpretation, claim 1 comprises a method for protecting data stored in a RAID-configured storage system from uncorrectable media errors, such that the RAID-configured storage system has a plurality of storage units. (See claim 1, lines 1-3, underlining added.)

10. It follows, then, that the Examiner's major premise is without basis because it is inconsistent with the "Broadest Reasonable Interpretation" standard set forth in MPEP § 2111, and, therefore, an unreasonable interpretation of the scope of the claimed "storage unit." Further, the Examiner's major premise simply does not make sense, particularly in light of the specification as it would be interpreted by one of ordinary skill in the art.

11. Regarding the Examiner's minor premise and conclusion, that is, "when  $c=1$ , any RAID system that has any parity in it whatsoever would teach claim 1", Applicants respectfully note that Applicants have already demonstrated that Servi does not disclose or suggest the claimed subject matter of claim 1.

12. Moreover, Applicants respectfully submit that NO RAID system teaches claim 1. Specifically, both a RAID 0 system and a RAID 1 system do not use parity. Consequently, a RAID 0 and/or a RAID 1 system simply cannot be the "any RAID system that has any parity in it whatsoever" to which the Examiner refers. A RAID 2 system utilizes ECC disks on which a Hamming Code is written for each data word on a separate data disk. That is, RAID 2 system, the Hamming Code for each data word is written on an ECC disk that is separate from the disk on which the data word is written. Both a RAID 3 system and a RAID 4 system utilize a dedicated disk for parity. A RAID 5 system utilizes parity distributed among the disks of the RAID system, but the parity for a data set is not written to the same disks in which the data set is written. A RAID 6 system utilizes dual parity distributed among the disks of the RAID system, but the dual parity for a data set is not written to the same disks in which the data set is written.

13. Thus, Applicants respectfully submit that none of the RAID systems to which the Examiner refers writes the  $n$  data information disk sectors with  $c$  redundancy information disk sectors on the same storage unit.

14. It should be noted that Applicants have respectfully invited the Examiner (and the Examiner is still invited) to prove how “when  $c=1$ , any RAID system that has any parity in it whatsoever would teach claim 1.” The Examiner has not responded to this invitation. Consequently, Applicants consider the Examiner’s lack of response to be a tacit admission by the Examiner that the Examiner cannot prove that “when  $c=1$ , any RAID system that has any parity in it whatsoever would teach claim 1”.

15. Applicants respectfully submit that if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). (See, also, MPEP § 2143.01.)

16. Thus, Applicants respectfully submit that the Examiner’s syllogism used to rebut Applicants’ arguments that the Examiner is improperly changing the principle of operation of Servi is without basis.

#### **D. The Examiner Ignores The Disclosure Of Servi**

1. Applicants respectfully submit that the Examiner’s conclusion regarding the obviousness of the subject matter of claim 1 ignores the fact that Servi does not disclose or suggest the subject matter of claim 1 because, as demonstrated above, none of the techniques disclosed by Servi to generate parity bits for a selected number of data bits yields  $c$  redundancy information disk sectors that are based on  $n$  data information disk sectors such that  $n$  and  $c$  are integer value numbers greater than zero.

2. At page 8, lines 10-11, of the final Office Action dated September 3, 2008, the Examiner asserts that “applicant’s remarks are not commensurate in scope with the language of the claims.”

3. Applicants respectfully submit that contrary to the Examiner's assertion, "applicant's remarks" are commensurate in scope with the language of the claims. In particular, Applicants have demonstrated that using any of the techniques disclosed by Servi to generate parity bits for a selected number of data bits does not yield the subject matter of claim 1. That is, none of the techniques disclosed by Servi to generate parity bits for a selected number of data bits discloses or suggests  $c$  redundancy information disk sectors that are based on  $n$  data information disk sectors such that  $n$  and  $c$  are integer value numbers greater than zero – a feature of claim 1.

4. Applicants respectfully submit that the Examiner has not demonstrated that (1) that the disclosed Servi techniques (i.e., Tables 1 and/or 4 and Tables 5-8) can be used for generating parity bits based on a specified number of data bits such that  $c$  redundancy information disk sectors are generated based on  $n$  data information disk sectors, and such that  $n$  and  $c$  are integer value numbers greater than zero, and (2) that "any RAID system that has any parity in it whatsoever would teach claim 1".

5. Instead, the Examiner responds by merely asserting that "Applicant's allegation that the reference completely teaches away from the claimed invention does not address the actual sections of the reference applied to applicant's claims, nor does it address each and every embodiment disclosed by the reference and how each and every embodiment supposedly 'teaches away' from Applicant's invention (and not just 1 example from the reference)." (See Advisory Action dated October 31, 2008, page 3, lines 2-5.)

6. Thus, Applicants respectfully submit that rather than demonstrating that Servi is applicable to the claimed subject matter, even when invited, the Examiner has responded by changing the rejection from being based on a few actually cited sections of Servi to now be based on "each and every embodiment" of Servi "and not just 1 example".

7. Applicants respectfully submit that changing the rejection from being based on a few actually cited sections of Servi to now be based on "each and every embodiment" of Servi without any further specificity suggests that (1) the Examiner is tacitly admitting that the disclosure of Servi is really being ignored in order to make the rejection, and (2) the originally

stated rejection of claim 1 as unpatentable over the few actually cited sections of Servi really was not (and still is not) a *prima facie* case of obviousness.

**E. The Examiner Is Using Impermissible Hindsight To Make The Rejection**

1. The Examiner's conclusion regarding the obviousness of the subject matter of claim 1 has been shown to improperly change the principle of operation of Servi.

2. The Examiner's conclusion regarding the obviousness of the subject matter of claim 1 has been shown to be ignoring the disclosure of Servi.

3. Additionally, Applicants respectfully submit that a person of ordinary skill in the art would simply not use or modify the Servi technique to obtain the subject matter of claim 1 because in order to use or modify Servi to become the subject matter of claim 1, common sense dictates that the high expected percentage loss of data bits provided by Servi would be plainly unacceptable to one of ordinary skill in the art, particularly in view of the environment of claim 1. (Note the high-percentage losses of 1%, 10%, 20%, 50% and 75% disclosed by Servi in Tables 5-8.)

4. Further still, Applicants respectfully submit that if it really was so obvious to modify Servi as proffered by the Examiner, then why cannot Applicants and the Examiner modify Servi to form the subject matter of claim 1?

5. Accordingly, Applicants respectfully submit that the proffered line of reasoning used by the Examiner for modifying Servi is nothing more than a conclusory statement without support. "Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness," See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) (cited with approval in KSR).

6. As such, Applicants respectfully submit that the Examiner's line of reasoning for modifying Servi cannot be convincing because the Examiner has not provided a rational underpinning to support the proffered line of reasoning.

7. Applicants respectfully submit that it is only by impermissible hindsight that the Examiner is able to reject claim 1 based on the modification of Servi. Servi does not disclose or suggest the subject matter of claim 1. The Examiner does not state that Servi expressly or impliedly suggests the claimed subject matter. To modify Servi as proffered by the Examiner causes the principle of operation of Servi to be improperly changed. Further, Applicants respectfully submit that the proffered motivation for modifying Servi is a conclusory statement without any rational underpinning to support the line of reasoning. Thus, the Examiner provides an unconvincing line of reasoning for modifying Servi. It is only by using Applicants' disclosure as a template that the Examiner is able to select particular features of Servi through a hindsight reconstruction of claim 1 to make the rejection.

8. Thus, Applicants respectfully submit that the bottom line is that while there may be the possibility that the subject matter of claim 1 may be unpatentable over some yet unidentified prior art, it is plain that the Examiner has not made a *prima facie* case of obviousness and the subject matter of claim 1 is patentable over Servi.

9. Consequently, Applicants respectfully request that this rejection be withdrawn and claim 1 allowed.

## **II. The Rejection Based On Servi In View of Kaneda**

A. Applicants respectfully submit that the subject matter of any of claims 3, 8, 9, 13 and 14 is patentable over Servi in view of Kaneda because Kaneda does not cure the deficiencies of Servi with respect to claim 1, the base claim for each of claims 3, 8, 9, 13 and 14.

B. In particular, Applicants respectfully submit that Kaneda does not cure the lack of Servi disclosing or suggesting the subject matter of claim 1, the Examiner's improper change of the principle of operation of Servi, and Kaneda does not cure the Examiner's unconvincing line of reasoning for modifying Servi.

C. Consequently, Applicants respectfully request that this rejection be withdrawn and claims 3, 8, 9, 13 and 13 be allowed.

### **The Rejection Based On Servi In View of Hetzler**

A. Applicants respectfully submit that the subject matter of any of claims 2, 4-7 and 10-12 is patentable over Servi in view of Hetzler because Hetzler does not cure the deficiencies of Servi with respect to claim 1, the base claim for each of claims 2, 4-7 and 10-12.

B. In particular, Applicants respectfully submit that Hetzler does not cure the lack of Servi disclosing or suggesting the subject matter of claim 1, the Examiner's improper change of the principle of operation of Servi, and Hetzler does not cure the Examiner's unconvincing line of reasoning for modifying Servi.

C. Consequently, Applicants respectfully request that this rejection be withdrawn and claims 3, 8, 9, 13 and 13 be allowed.

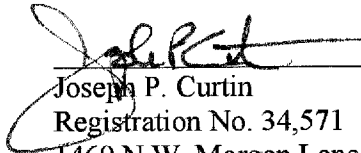
## CONCLUSION

In view of the above arguments, it is urged that the present application is in condition for allowance.

It is requested that this application be passed to issue with claims 1-14.

Respectfully submitted,

Date: February 6, 2009



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## CLAIMS APPENDIX

1. (previously presented) A method for protecting data stored in a RAID-configured storage system from uncorrectable media errors, the RAID-configured storage system having a plurality of storage units, the method comprising:

associating  $n$  data information disk sectors with  $c$  redundancy information disk sectors, the  $c$  redundancy information disk sectors being based on the  $n$  data information disk sectors, and  $n$  and  $c$  being integer value numbers greater than zero; and

writing the  $n$  data information disk sectors with  $c$  redundancy information disk sectors on the same storage unit.

2. (original) The method according to claim 1, wherein the RAID-configured storage system is configured as a RAID 6 storage system.

3. (original) The method according to claim 1, wherein the RAID-configured storage system is configured as a RAID 5 storage system.

4. (original) The method according to claim 1, wherein the RAID-configured storage system is configured as a RAID 51 storage system.

5. (original) The method according to claim 1, wherein the RAID-configured storage system is configured as a RAID 3 + 3 storage system.

6. (original) The method according to claim 1, wherein the RAID-configured storage system is configured as a RAID  $N + 3$  storage system.

7. (original) The method according to claim 1, wherein the redundancy information is based on a Reed-Solomon code.



8. (original) The method according to claim 1, wherein the redundancy information is an XOR-based code.

9. (original) The method according to claim 1, wherein the redundancy information is a one-dimensional parity.

10. (original) The method according to claim 1, wherein the storage unit is a hard disk drive.

11. (original) The method according to claim 1, wherein the storage unit is an optical drive.

12. (original) The method according to claim 1, wherein the storage unit is a random access memory.

13. (previously presented) The method according to claim 1, wherein the  $n$  data information disk sectors and the  $c$  redundancy information disk sectors are written consecutively.

14. (previously presented) The method according to claim 1, wherein the  $n$  data information disk sectors and the  $c$  redundancy information disk sectors are intermingled when written.

15. (canceled)

16. (withdrawn) A storage medium having a recording format therein, the format comprising  $c$  redundancy information disk sectors that are associated with  $n$  data information disk sectors to form a segment, the  $c$  redundancy information disk sectors being based on the  $n$

data information disk sectors,  $n$  and  $c$  being integer value numbers greater than zero, and the segment being stored on a single storage medium that is part of a single storage unit in an array of storage units in a RAID-configured storage system.

17. (withdrawn) The storage medium according to claim 16, wherein the RAID-configured storage system is configured as a RAID 6 storage system.

18. (withdrawn) The storage medium according to claim 16, wherein the RAID-configured storage system is configured as a RAID 5 storage system.

19. (withdrawn) The storage medium according to claim 16, wherein the RAID-configured storage system is configured as a RAID 51 storage system.

20. (withdrawn) The storage medium according to claim 16, wherein the RAID-configured storage system is configured as a RAID 3 + 3 storage system.

21. (withdrawn) The storage medium according to claim 16, wherein the RAID-configured storage system is configured as a RAID  $N + 3$  storage system.

22. (withdrawn) The storage medium according to claim 16, wherein the redundancy information is based on a Reed-Solomon code.

23. (withdrawn) The storage medium according to claim 16, wherein the redundancy information is an XOR-based code.

24. (withdrawn) The storage medium according to claim 16, wherein the redundancy information is a one-dimensional parity.

25. (withdrawn) The storage medium according to claim 16, wherein the storage unit is a hard disk drive.

26. (withdrawn) The storage medium according to claim 16, wherein the storage unit is an optical drive.

27. (withdrawn) The storage medium according to claim 16, wherein the storage unit is a random access memory.

28. (withdrawn) The storage medium according to claim 16, wherein the  $n$  data information disk sectors and the  $c$  redundancy information disk sectors are in a consecutive arrangement.

29. (withdrawn) The storage medium according to claim 16, wherein the  $n$  data information disk sectors and the  $c$  redundancy information disk sectors are in an intermingled arrangement.

30. (withdrawn) A storage system, comprising:  
an array controller; and  
a plurality of storage units coupled to the array controller, the storage units being configured in a RAID configuration, and at least one data segment being stored on at least one storage unit, each data segment including  $n$  data information disk sectors and  $c$  redundancy information disk sectors, the  $c$  redundancy information disk sectors being based on the  $n$  data information disk sectors, and  $n$  and  $c$  being integer value numbers greater than zero.

31. (withdrawn) The storage system according to claim 30, wherein the storage system is configured as a RAID 6 storage system.

32. (withdrawn) The storage system according to claim 30, wherein the storage system is configured as a RAID 5 storage system.

33. (withdrawn) The storage system according to claim 30, wherein the storage system is configured as a RAID 51 storage system.

34. (withdrawn) The storage system according to claim 30, wherein the storage system is configured as a RAID 3 + 3 storage system.

35. (withdrawn) The storage system according to claim 30, wherein the storage system is configured as a RAID N + 3 storage system.

36. (withdrawn) The storage system according to claim 30, wherein the redundancy information is based on a Reed-Solomon code.

37. (withdrawn) The storage system according to claim 30, wherein the redundancy information is an XOR-based code.

38. (withdrawn) The storage system according to claim 30, wherein the redundancy information is a one-dimensional parity.

39. (withdrawn) The storage system according to claim 30, wherein the data segment is stored on at least one storage unit that is a hard disk drive.

40. (withdrawn) The storage system according to claim 30, wherein the data segment is stored on at least one storage unit that is an optical drive.

41. (withdrawn) The storage system according to claim 30, wherein the data segment is stored on at least one storage unit that is a random access memory.

42. (withdrawn) The storage system according to claim 30, wherein the  $n$  data information disk sectors and the  $c$  redundancy information disk sectors are in a consecutive arrangement.

43. (withdrawn) The storage system according to claim 30, wherein the  $n$  data information disk sectors and the  $c$  redundancy information disk sectors are in an intermingled arrangement.

## **EVIDENCE APPENDIX**

No Additional Evidence Submitted

## **RELATED PROCEEDINGS APPENDIX**

No related proceedings